

view of Kotecki et al (Kotecki). The Applicants respectfully traverse the Examiner's rejection.

Claim 1, as amended, specifically recites a conductive barrier layer; a first conductive liner, a second conductive liner and a conductive layer where each of these elements is electrically coupled to each of the other elements. Further, claim 1 requires that the conductive layer and the first conductive liner comprise the same material. Applicants respectfully submit that the references of record do not teach or suggest the limitations of claim 1.

In particular, the references of record do not teach or suggest a single electrode with a conductive layer and a first conductive liner of the same material, as required by claim 1. As noted by the Examiner, the prior art does teach conductive electrodes. In fact, Applicant finds the teaching of three different electrodes: (1) AAPA Figure 2¹ teaches an electrode comprising conductive barrier 122, Ir layer 132, IrO₂ layer 134, and Pt electrode 124; (2) Kotecki teaches a bottom electrode comprising a barrier layer and a Pt electrode; and (2) Kotecki teaches a top electrode comprising Pt. Applicant respectfully submits that one of ordinary skill in the art would not derive the claimed invention based upon the teachings of these three electrodes.

The Examiner correctly states that Kotecki teaches a DRAM structure including a BSTO dielectric layer between the top and bottom electrodes. Applicant respectfully disagrees, however, that this teaching provides any suggestion to modify the electrode shown in AAPA. Kotecki's Pt layers are two separate electrodes. Neither reference provides any suggestion to replace one of AAPA's layers with one of Kotecki's electrodes. The only reasonable comparison would be to compare AAPA's electrode with one of the Kotecki electrodes. This comparison does not lead in

¹ The discussion of Figure 2 on page 3 of the specification reference to Japanese patent application publication 10-242078, which should be viewed independently from Applicant's characterization

any way to the claimed invention.

To explain the combination of these two separate teachings, the Examiner states that the motivation is "to provide electrodes with good adhesion." The Examiner, however, has provided no explanation as to how a teaching that Pt adheres between a barrier layer and a BSTO layer² would motivate one to use a Pt layer between a barrier layer a IrO₂ layer. What in the references would provide this motivation?

The Examiner also states that a motivation to combine would be to "improve the electrical conductivity characteristics of the electrode, by the use of platinum group metals such as platinum and iridium." But the Examiner has provided no teaching in the references that the use of platinum would improve the electrical conductivity characteristics of an electrode. Plainly stated, the only teaching of record in this application of an electrode with a conductive layer and a first conductive liner of the same material is in Applicant's specification. Certainly, this teaching cannot be used as prior art to the claims at issue.

Thus, it would not be obvious, and there is no motivation, to modify the structure shown in Figure 2 by the selection of the same material for a conductive layer and first conductive liner. Therefore, the Applicants assert that the Applicants' independent claim 1 is allowable over the references of record.

Claims 2-7, 21, 23, 25 and 26 depend from claim 1 and add further limitations. It is respectfully submitted that these dependent claims are allowable by reason of depending from an allowable claim as well as for adding further limitations.

thereof. Applicant does not believe that the substantive positions will change.

² Assuming that Kotecki provides such a teaching.

Independent claim 8 specifically recites a first conductive liner comprising a molecular grain structure having a plurality of columns and a conductive layer comprising a molecular grain structure having a plurality of columns, "wherein the columns of the conductive layer are not aligned with the columns of the first conductive liner." In the Advisory Action, the Examiner states that Kotecki teaches a first conductive liner and a conductive layer that have a molecular grain structure comprising columns "wherein the columns are not aligned, since Pt and Ir are different elements but from the same platinum metals group." Applicant, however, finds no teaching in the Kotecki reference that supports this conclusion. In particular, Applicant finds no teaching of molecular grain structure of columns, no teaching of columns not being aligned, and, in fact, no teaching of any Ir elements. If the Examiner's conclusion is based on the teachings of the cited prior art, then Applicant respectfully requests that the particular part of the reference being relied upon be designated. 37 C.F.R. § 1.104(c)(2).

In the final rejection, the Examiner stated that it would be obvious to modify the AAPA structure "to include first conductive liner and a conductive layer comprising Pt, since Pt and Ir are from the same platinum metals group, and having a molecular grain structure having a plurality of columns, wherein the columns of the conductive layer are not aligned with the columns of the first conductive liner, as clearly suggested by Kotecki, in order to improve oxidation resistance." First, Applicant can find no teaching where Kotecki "clearly suggests" that the columns of different layers are not aligned. In fact, Applicant cannot even find any teaching in Kotecki that teaches that the Pt layers have a molecular grain structure having a plurality of columns. Cf. Kotecki, page 373, col. 1, last paragraph. Further, Applicant can find no teaching in either of the cited prior art that discuss any improvement of oxidation resistance. Once again, Applicant respectfully requests that the

particular part of the reference being relied upon be designated.

Even if Kotecki did teach that the Pt layer of Kotecki's bottom electrode (what the Examiner refers to as the "first conductive liner") and the Kotecki's Pt top electrode (what the Examiner refers to as the "conductive layer") did comprise a molecular grain structure having a plurality of columns, Applicant can find no teaching in the reference that these layers have columns that are not aligned or that these layers can be combined with the electrode of the AAPA. Once again, Applicant notes that any motivation must come from the references, not from Applicant's specification.

As far as Applicant can tell, neither reference teaches a first conductive liner comprising a molecular grain structure having a plurality of columns, a conductive layer comprising a molecular grain structure having a plurality of columns, wherein the columns of the conductive layer are not aligned with the columns of the first conductive liner, as recited in claim 8. Therefore, combining prior art Figure 2 with Kotecki does not produce the invention of claim 8. Thus, independent claim 8 is allowable over the references of record.

Furthermore, it is respectfully submitted that claims 9-13, 22, 24, and 27, which depend from independent claim 8, are allowable by reason of dependence from an allowable claim as well as for adding further limitations, which narrow the scope of the particular independent claim and compel a broader interpretation of the base claim upon which they depend.

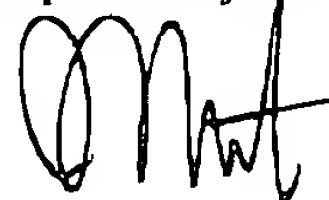
Independent claim 28 specifically recites a platinum liner comprising a molecular grain structure having a plurality of columns, and a platinum layer comprising a molecular grain structure having a plurality of columns, wherein at least one column of the platinum layer is not aligned with the columns of the platinum liner and wherein the platinum layer is electrically coupled to the

platinum liner. For all of the reasons stated above, Applicant respectfully submits that claim 28 is allowable over the references of record. For example, neither reference includes a single electrode with both a platinum liner and a platinum layer.

Furthermore, it is respectfully submitted that claims 29 and 31, which depend from independent claim 28, are allowable by reason of dependence from an allowable claim as well as for adding further limitations, which narrow the scope of the particular independent claim and compel a broader interpretation of the base claim upon which it depends.

In conclusion, the Applicants respectfully request that the Examiner pass the present patent application to issuance. If the Examiner should have any questions or feel that a discussion would advance the prosecution, the Applicants invite the Examiner to contact the Applicants' attorney at the telephone number listed below.

Respectfully submitted,



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Appendix A
Marked-up Version of Claims

1. (Twice Amended) A multi-layer electrode for an integrated circuit, comprising:
 - a conductive barrier layer;
 - a first conductive liner [deposited] ~~disposed over and electrically coupled to the conductive barrier layer;~~
 - a second conductive liner [deposited] ~~disposed over the first conductive liner, the second conductive liner being electrically coupled to the first conductive liner and the conductive barrier layer;~~ and
 - a conductive layer [deposited] ~~disposed over the second conductive liner, the conductive layer being electrically coupled to the first conductive liner, the conductive barrier layer and the second conductive liner,~~ wherein the conductive layer and the first conductive liner comprise the same material.

8. (Twice Amended) A multi-layer electrode for an integrated circuit, comprising:
 - a conductive barrier layer;
 - a first conductive liner deposited over ~~and abutting~~ the conductive barrier layer, the first conductive liner comprising a molecular grain structure having a plurality of columns;
 - a second conductive liner deposited over ~~and abutting~~ the first conductive liner, the second conductive liner comprising a conductive oxide; and
 - a conductive layer deposited [on] ~~over and abutting~~ the second conductive liner, the

conductive layer comprising a molecular grain structure having a plurality of columns, wherein the columns of the conductive layer are not aligned with the columns of the first conductive liner.

28. (Twice Amended) An electrode for a semiconductor device, comprising:

a conductive barrier layer;

a platinum liner formed over the conductive barrier layer, the platinum liner comprising a molecular grain structure having a plurality of columns;

a conductive oxide formed over the platinum liner[, the conductive oxide having a thickness of 20-50 Angstroms]; and

a platinum layer formed over the conductive oxide, the platinum layer comprising a molecular grain structure having a plurality of columns, wherein at least one column of the platinum layer is not aligned with the columns of the platinum liner, wherein the platinum layer is electrically coupled to the platinum liner.

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